

WHAT IS CLAIMED IS:

1. A process for the production of lactic acid product from a mixture containing free lactic acid and dissolved lactate salt; said method including steps of:
 - (a) providing a mixture having a molar ratio of undissociated lactic acid to lactate anion of at least 0.070:1;
 - (b) preferentially separating lactate salt versus lactic acid from the mixture and into a selected product stream to generate:
 - (i) an isolated lactate salt stream; and,
 - (ii) a lactic acid containing stream.
2. A process according to claim 1 wherein:
 - (a) said step of preferentially separating includes a simultaneous step of also preferentially separating lactic acid into a selected separate stream.
3. A process according to claim 1 wherein:
 - (a) said lactic acid containing stream is residual material from said mixture after removal of lactate salt.
4. A process according to claim 3 wherein:
 - (a) said mixture comprises an aqueous mixture removed from a fermentor.
5. A process according to claim 4 wherein:
 - (a) said process is conducted such that said isolated lactate salt stream is a stream selected from calcium lactate, sodium lactate, ammonium lactate and mixtures thereof; and
 - (b) at least a portion of the isolated salt stream is added to the fermentor.
6. A process according to claim 4 including a step of:

- (a) filtering the aqueous mixture removed from a fermentation broth, prior to said step of preferentially separating.
7. A process according to claim 3 wherein:
- (a) said step of preferentially separating comprises a step of lactate salt crystallization from the mixture.
8. A process according to claim 7 wherein:
- (a) said step of lactate salt crystallization comprises a step of calcium lactate crystallization.
9. A process according to claim 3 wherein:
- (a) said step of preferentially separating is selected from:
 - (i) a step of adsorbing lactate anion salt onto a solid adsorbent; and,
 - (ii) a step of electrodialysis.
10. A process for production of lactic acid product from a mixture containing free lactic acid and dissolved lactate salt; said method including steps of:
- (a) providing a mixture of lactic acid and dissolved lactate salt;
 - (b) preferentially extracting lactic acid versus lactate salt from the mixture and into a non-aqueous phase; and,
 - (c) condensing lactic acid in the non-aqueous phase to form oligomer.
11. A process according to claim 10 including a step of:
- (a) separating the lactic acid oligomer from the non-aqueous extractant.
12. A process according to claim 10 wherein:

- (a) said step of providing a mixture comprises providing a mixture having a pH of no greater than 5.0.
13. A process according to claim 10 wherein:
- (a) said step of providing a mixture comprises providing an aqueous mixture which has been modified by addition of acid thereto, following removal from a fermentor.
14. A process according to claim 10 including a step of:
- (a) adding phosphoric acid to the aqueous mixture, to obtain at least one calcium salt of phosphoric acid, after a step of removing the mixture from a fermentor.
15. A process according to claim 10 including a step of:
- (a) directly forming lactide from the oligomer in the presence of the non-aqueous phase.
16. A process according to claim 15 wherein:
- (a) said step of preferentially extracting lactic acid into a non-aqueous phase comprises extracting into a phase comprising tertiary amine.
17. A process according to claim 10 wherein:
- (a) said step of condensing is conducted under conditions sufficient to form an oligomer phase and a separate non-aqueous extractant phase; and,
 - (b) said step of separating comprises separating the separate oligomer phase and extractate phase.
18. A process according to claim 17 wherein:
- (a) said step of providing a mixture comprises providing a mixture having a pH of at least 3.0.

19. A process according to claim 17 wherein:
- (a) said oligomer phase, after said step of separating, includes residual tertiary amine having at least 18 carbon atoms; and,
 - (b) said step of directly forming lactide is conducted without a prior step of removing the residual tertiary amine from the oligomer phase.
20. A process for the production of lactic product acid products from a mixture containing free lactic acid and dissolved lactate salt; said method including steps of:
- (a) providing an aqueous mixture of free lactic acid and dissolved lactate salt having:
 - (i) a pH within the range of 3.0 to 4.8; and,
 - (ii) a concentration of at least 50g/liter of a lactic acid enantiomer selected from L-lactic acid and D-lactic acid; and,
 - (b) preferentially separating lactic acid salt from the aqueous mixture and into a lactic acid stream.
21. A process according to claim 20 wherein:
- (a) said aqueous mixture comprises L-lactic acid with a chiral purity of at least 75%.
22. A process according to claim 21 wherein:
- (a) said step of providing an aqueous mixture comprises providing a fermentation broth having a pH of no greater than 4.2 and a concentration of L-lactic acid of at least 80g/liter.
23. A process according to claim 22 wherein:
- (a) said step of preferentially separating is selected from:
 - (i) preferentially extracting lactic acid into a non-aqueous phase; and
 - (ii) preferentially adsorbing lactic acid onto a solid adsorbent.

24. A process according to claim 22 wherein:

- (a) said step of preferentially separating comprises preferentially extracting lactic acid into a non-aqueous phase; and,
- (b) said process includes a step of separating the lactic acid from the non-aqueous phase by a step selected from:
 - (i) distillation; and
 - (ii) back extraction into another solvent.